

Claims

[c1] What is claimed is:

1.A method of fabricating a liquid crystal display device, the method comprising the steps of:
providing a substrate;
forming a polysilicon layer over the substrate;
performing a first photo-etching-process to define at least one active area and a bottom storage electrode over the substrate;
performing a second photo-etching-process to form a first mask over the substrate;
performing a P-type ion implantation process by utilizing the first mask as a mask to form a source electrode and a drain electrode in the active area and to dope dopants into the bottom storage electrode simultaneously;
removing the first mask;
forming a metal layer over the substrate to cover the active area and the bottom storage electrode;
performing a third photo-etching-process to form a gate electrode over the active area and to form a top storage electrode on the bottom storage electrode;
forming a first isolation layer over the substrate to cover

the gate electrode and the top storage electrode; performing a fourth photo-etching-process to form at least one first contact hole electrically connected to the source electrode, the drain electrode, and the gate electrode; forming a conductive layer over the first isolation layer to fill in the first contact hole; performing a fifth photo-etching-process to form a source wire and a drain wire on the first isolation layer, the source wire and the drain wire being electrically connected to the source electrode and the drain electrode through the first contact hole respectively; and forming a second isolation layer over the substrate to cover the first isolation layer, the source wire, and the drain wire.

- [c2] 2.The method of claim 1 wherein the substrate comprises a glass substrate or a quartz substrate.
- [c3] 3.The method of claim 1 wherein the method for forming the polysilicon layer further comprises the following steps:
 - performing a sputtering process to form an amorphous silicon layer on the surface of the substrate; and
 - performing an annealing process to re-crystallize the amorphous silicon layer to the polysilicon layer.

- [c4] 4.The method of claim 3 wherein the annealing process is an excimer laser annealing process.
- [c5] 5.The method of claim 1 wherein the P-type ion implantation process is a high concentration P-type ion implantation process to form the source electrode and the drain electrode.
- [c6] 6.The method of claim 1 wherein a step for forming a third isolation layer over the entire substrate is performed before the second photo-etching-process to cover the active area and the bottom storage electrode.
- [c7] 7.The method of claim 6 wherein the material composition of the third isolation layer comprises silicon oxide formed by utilizing tetra-ethyl-ortho-silicate(TEOS) as a reaction gas, silicon oxide, or silicon nitride.
- [c8] 8.The method of claim 1 wherein a step for forming a fourth isolation layer on the entire substrate is performed after removing the first mask to cover the active area and the bottom storage electrode.
- [c9] 9.The method of claim 8 wherein the material composition of the fourth isolation layer comprises silicon oxide formed by utilizing tetra-ethyl-ortho-silicate(TEOS) as a reaction gas, silicon oxide, or silicon nitride.

- [c10] 10.The method of claim 1 wherein the material composition of the metal layer comprises tungsten (W) or chrome (Cr).
- [c11] 11.The method of claim 1 wherein the first isolation layer comprises a silicon oxide layer, a silicon nitride layer, or a silicon oxynitride layer.
- [c12] 12. The method of claim 1 wherein the source wire is used as a data line.
- [c13] 13.The method of claim 1 wherein the second isolation layer is a planarization layer, and the second isolation layer comprises a silicon oxide layer, a silicon nitride layer, or a silicon oxide layer formed by utilizing tetraethyl-ortho-silicate as a reaction gas.
- [c14] 14.The method of claim 1 wherein the material composition of the transparent conductive layer comprises indium tin oxide(ITO) or indium zinc oxide (IZO).
- [c15] 15.The method of claim 1 further comprising the following steps:
 - performing a sixth photo-etching-process to remove portions of the second isolation layer to form at least one second contact hole electrically connected to the drain wire;
 - forming a transparent conductive layer on the second

isolation layer; and
performing a seventh photo-etching-process to remove portions of the transparent conductive layer to form at least one pixel electrode on the second isolation layer, each pixel electrode being electrically connected to each drain wire through each second contact hole filled with the transparent conductive layer.